Amendments to the Specification:

Please amend the paragraphs beginning on page 1, line 10, as follows:

In a conventional fly-back converter which is a switching power supply device having a synchronous rectification type rectifying circuit, a series circuit comprising a DC power source and a main switching element is connected to a primary winding side of a transformer, and a synchronous rectifying element is provided to a secondary winding of the transformer in series, and further connected to an output terminal through a rectifying circuit as disclosed in JP-A-2000-116122. The fly-back converter controls to turn on/off the main switch element of a MOS-FET. When the main switch element is turned off, the MOS-FET which is a synchronous rectifying element of the secondary side circuit of the transformer is turned on, and an output capacitor of the rectifying circuit is charged by a fly-back voltage occurring at the secondary winding. Thereafter, the synchronous rectifying element is turned off before the main switch element is turned on, and this operation is repeated to supply power to the output side.

In the case of the synchronous rectifying type fly-back converter as described above, when the off-timing of the

synchronous rectifying element is missed and thus the main switch is turned on under the state that the synchronous rectifying element is still turned on, the circuit at the secondary side of the power supply device falls into a short-circuited state, and thus a large surge current flows into the main switch element, so that the main switch element, the synchronous rectifying element, etc. may be broken.

Please amend the paragraphs beginning on page 3, line 9, as follows:

However, in the case of the conventional synchronous rectifying type fly-back converter, there is a case where load current increases rapidly and the main switch element is turned on for a time longer than the on-time of the main switch element determined by the input/output voltage and the turn ratio of the transformer. In such a case, there is a case where the voltage of the timing capacitor does not reach the threshold voltage of the auxiliary transistor element for turning off the synchronous rectifying element within a fixed on/off period of the main switch element as indicated by a broken line of Fig. 1. In such a case, there is a problem that the main switch element is turned on before the rectifying element is turned off, and a very large

surge current flows into the main switch element, so that the circuit at the secondary side of the power supply device is kept short-circuited and thus through current flows into the secondary side circuit, resulting in breaking of the main switch element, the synchronous rectifying element, etc.

During the period of the dead time td, the rectifying operation is carried out by a diode connected to the synchronous rectifying element in parallel or a body diode of MOS-FET serving as the synchronous rectifying element. The loss during the rectifying period of the diode is larger than that during the period when the rectifying element of the MOS-FET is turned on. Accordingly, the dead time is required to be as short as possible, however, there is a problem that it is impossible to shorten the dead time td in order to surely turn off the synchronous rectifying element before the main switch element is turned on. Furthermore, the switching frequency cannot be increased because the dead time td cannot be shortened, which also prevents miniaturization and ~~cost down of~~ lower cost to produce the device.

Please amend the paragraph beginning on page 5 at line 4 as follows:

Furthermore, the invention has an object to provide a fly-back type synchronous rectifying switching power supply device which can prevent through current of a switching power supply circuit and self-excitation oscillation irrespective of sudden variation of a load or [[an]] external equipment connected between the output terminals.

Please amend the paragraphs beginning on page 5, line 11, as follows:

A fly-back type synchronous rectifying switching power supply device ~~in which~~ having a primary winding of a transformer and a main switch element are connected to each other in series between input terminals and which has a control circuit for subjecting the main switch element to PWM control within a fixed period, a synchronous rectifying element connected to a secondary winding of the transformer in series between output terminals, and driving means for turning on the synchronous rectifying element complementarily with the switching element, is equipped with a different power supply source charged by a pulse voltage occurring at the secondary [[side]] winding of the transformer through a switching operation of the main switch element, and interrupting means which is disposed between the gate and source of the synchronous rectifying element and turns off the

synchronous rectifying element, wherein an off-timing at which the interrupting means turns off the synchronous rectifying element is set to a timing which corresponds to a fixed time set by current from the different power source after the switch element is turned on and is within a range which is as near as a fixed driving period of the switch element.

The interrupting means ~~comprises~~ includes a transistor and a timing capacitor connected to a signal input terminal of the transistor, the timing capacitor is charged by the different power source and discharged at the instantaneous time when the main transistor is turned on, the timing capacitor is started to be charged from the instantaneous time concerned, and a period from this time to time in which the voltage of the timing capacitor exceeds a threshold value of the signal input terminal of the transistor is set to a time within the fixed driving period of the switch element.

The different power source is a constant voltage source or constant current source connected to the secondary [[side]] winding of the transformer. A snubber circuit for absorbing surge energy when the synchronous rectifying element is turned off may be also used as the different power source for charging the timing capacitor so that the timing capacitor is charged with the energy absorbed by the snubber circuit.

Please amend the paragraphs beginning on page 7, line 12, as follows:

Furthermore, a fly-back type synchronous rectifying switching power supply device ~~in which~~ includes a primary winding of a transformer and a main switch element are connected to each other in series between input terminals and which has a control circuit for subjecting the main switch element to PWM control within a fixed period, a synchronous rectifying element connected to a secondary winding of the transformer in series between output terminals, and driving means for turning on the synchronous rectifying element complementarily with the switching element, is equipped with a different power supply source charged by a pulse voltage occurring at the secondary side winding of the transformer through a switching operation of the main switch element, interrupting means which is disposed between the gate and source of the synchronous rectifying element and turns off the synchronous rectifying element, and a control element for comparing the output voltage of the different power source with the output voltage of the output terminal of the switching power supply device, and controlling the interrupting means to turn off the synchronous rectifying element when the output voltage of the different power source is reduced to a fixed value or less.

A transistor of the interrupting means is an npn transistor for turning off the synchronous rectifying element, and the control element ~~comprises~~ includes a pnp transistor whose emitter and collector are connected to the output terminal and the base of the npn transistor respectively, and the output of the different power source is connected to the base of the pnp transistor. The output voltage of the different power source may be divided and input a divided voltage to the base of the pnp transistor.

Please amend the paragraph beginning on page 21, line 6, as follows:

Furthermore, the auxiliary winding N3 as the driving means of the synchronous rectifying element Q2 is equipped at the secondary side of the transformer T, the dot-affixed side terminal of the auxiliary winding N3 is connected to the reference potential, and the non-dot-affixed side terminal thereof is connected to the gate of the synchronous rectifying element Q2 through a speed-up capacitor C4. The non-dot-affixed side terminal of the auxiliary winding [[3]] N3 is connected to the cathode of the diode D6, and the anode of the diode D6 is connected through the series circuit of a resistor R7 and a timing capacitor C3 to the reference potential. The point between

the resistor R7 and the timing capacitor C3 is connected to the point between the cathode of the diode D3 and the capacitor C6 of the constant voltage source 16 through a resistor R2. Furthermore, the point between the resistor R7 and the capacitor C3 is connected to the base of the transistor Trl. The collector of the transistor Trl is connected to the gate of the synchronous rectifying element Q2, and the emitter thereof is connected to the reference potential. The cathode of the diode D1 is connected to the gate of the synchronous rectifying element Q2, and the anode of the diode D1 is connected to the reference potential.

Please amend the paragraph beginning on page 23, line 6, as follows:

At the same time when the main switch element Q1 is turned off, the charging of the timing capacitor C3 is started through the resistor R2 by the constant voltage source 16. Accordingly, the potential of the timing capacitor C3 is gradually increased, and when it reaches the potential at which the transistor TR1 is turned on, the transistor TR1 is turned on and the charges of the gate of the synchronous rectifying element Q2 are ~~discharges~~ discharged, thereby turning off the synchronous rectifying element Q2. The timing at which the transistor TR1 is turned on is set to a timing just before the main switch element Q1 is

turned on. When the main switch element Q1 is turned on, the charging of the capacitor C6 of the constant voltage source 16 is started again, and the timing capacitor C3 is discharged through the resistor R7 and the diode D6.

Please amend the Abstract of the Disclosure as follows. An Abstract of the Disclosure is submitted on a separate sheet as an appendix to this response, as required under 37 CFR 1.72(b).

Abstract

~~There is provided a flay-back~~ A fly-back type synchronous rectifying switching power supply device in which a rectifying element is ~~surely~~ turned off before the main switch is turned on even when the on-time of a main switch element is lengthened due to sudden variation of a load. The synchronous rectifying switching power supply device is equipped with a synchronous rectifying element [[(Q2)]] connected to a secondary winding [[(N2)]] of a transformer [[(T)]] in series and driving means ~~comprising~~ including an auxiliary winding [[(N3), etc.]] for turning on the synchronous rectifying element [[(Q2)]] complementarily with a main switch element [[(Q1)]] between output terminals [[(13, 14)]]. A transistor [[(Tr1)]] serving as interrupting means for turning off the synchronous rectifying

element [[(Q2)]] is provided between the gate and source of the synchronous rectifying element [[(Q2)]]. An off-timing at which the synchronous rectifying element [[(Q2)]] is turned off by the interrupting means [[(Trl)]] is set within a timing range which corresponds to a fixed time after the main switch element [[(Q1)]] is turned on and also is as near as a fixed driving period of the main switch element [[(Q1)]].